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Thermodynamic properties of 3-dimensional quantum antiferromagnets[1] RAJIV R.P. SINGH, Physics Department, University of California at Davis, CA 95616, JAAN OITMAA, School of Physics, The University of New South Wales, Sydney 2052, Australia, MICHEL J.P. GINGRAS, Department of Physics and Astronomy, University of Waterloo, Waterloo, Ontario, N2L 3G1, Canada — We present systematic calculations of thermal properties of 3-dimensional quantum antiferromagnets, in the thermodynamic limit, using series expansions. For this purpose, High Temperature Expansions (HTE) are supplemented by Numerical Linked Cluster (NLC) Expansions.[2] These expansions provide essentially exact calculations of thermodynamic properties of the system at (i) all fields at high temperatures and (ii) at all temperatures at high fields. In addition, we show that for classical exchange spin-ice model defined on the pyrochlore lattice, the first order NLC leads to the Pauling approximation, which gives even the zero-field ground state entropy to about one percent accuracy. Thus, these calculations are accurate over a wide parameter range. Results are presented and compared with a variety of experimental systems including pyrochlore materials $Yb_2Ti_2O_7$ and $Er_2Ti_2O_7$ and the Hyper Kagome material $Na_4Ir_3O_8$

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[2]R. Applegate et al, Phys. Rev. Lett. 109, 097205 (2012); R. R. P. Singh and J. Oitmaa Phys. Rev. B 85, 144414 (2012); R. R. P. Singh and J. Oitmaa Phys. Rev. B 85, 104406 (2012).

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